ENV.
CA20N
EVR.25
1988
T58

~~LTD DISTRIB.~~
~~JAN 89.~~

~~** Free~~

TOWN OF WHITBY

BROOKLIN SANITARY SURVEY

ONTARIO LEGISLATIVE LIBRARY
RECEIVED
~~[illegible]~~
~~CHECKLIST AND CATALOGUE SERVICE~~

APRIL 1988

AVAIL. FROM: MIN ENV.; CENTRAL REGION
7 OVERLEA BLVD, 4th FL.
TORONTO M4H 1A8

Ontario
Ministry
of the
Environment

G. MIERZYNSKI, Director
Central Region

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca

TOWN OF WHITBY

BROOKLIN SANITARY SURVEY

LEGISLATIVE LIBRARY OF ONTARIO
TORONTO
APR 0 8 1995
RECEIVED

April 1988

c Queen's Printer for Ontario, 1988

TABLE OF CONTENTS

Page

INTRODUCTION 1

BACKGROUND 1

DESCRIPTION STUDY AREA 2

SURVEY PROCEDURES

1. WATER QUALITY PARAMETER DESCRIPTION 3
2. STATION DESCRIPTION 11
3. WATER QUALITY 12
4. WELL QUALITY 14
5. PRIVATE SEWAGE SYSTEMS 14

RESULTS

1. STREAM WATER QUALITY INTERPRETATION 15
2. PRIVATE SEWAGE SYSTEMS 18
3. WELL QUALITY 23

SUMMARY AND CONCLUSION

1. STREAM WATER QUALITY 23
2. WELL QUALITY 24
3. PRIVATE SEWAGE SYSTEMS 25

RECOMMENDATIONS 25

SAMPLING STATIONS ....APPENDIX I

SURVEY FORMS .... " II

" .... " III

" .... " IV

LYNDE CREEK MEAN CALCULATIONS .... " V

WELL WATER QUALITY .... " VI

BACTERIOLOGICAL CONCENTRATIONS
OF LYNDE CREEK .... " VII

RÉSUMÉ

Le présent rapport a pour objet d'établir si les réseaux d'égouts privés posent un problème généralisé à Brooklin et de déterminer leurs répercussions éventuelles sur le ruisseau Lynde.

Un examen technique des données sur la qualité de l'eau du ruisseau Lynde effectué par le ministère de l'Environnement en 1978 a révélé que les objectifs de qualité de l'eau n'étaient pas respectés en ce qui concerne la densité bactérienne et la teneur en phosphore. La contamination semblait faible en amont de Brooklin, mais elle avait augmenté sensiblement à Brooklin même. On croit que les sources de pollution sont l'agriculture, les égouts pluviaux ou les eaux usées domestiques.

Le Bureau de santé de la région de Durham a signalé la défectuosité de certains réseaux d'égouts. Les inspections n'ont révélé aucun problème manifeste et le Bureau de santé n'a pas effectué d'enquête à l'échelle de la localité.

À la suite d'une audience publique tenue le 26 mars 1986, la localité a décidé de distribuer un questionnaire confidentiel afin de déterminer 1) l'intérêt de la collectivité à l'égard des solutions à apporter aux problèmes; 2) l'opinion des personnes concernées sur la tenue d'une enquête à l'échelle de la localité relativement aux réseaux d'égouts; 3) le degré de connaissance de l'efficacité, du fonctionnement et de l'entretien des systèmes septiques actuels.

Les résultats du questionnaire, posté à 602 résidences le 18 avril 1986, sont les suivants :

a) taux de réponse de 62 %;
b) 82 % des répondants accepteraient de participer à un sondage tenu à l'échelle de la localité;
c) 69 % sont satisfaits du fonctionnement actuel du système;
d) 28 % considèrent que leur réseau fonctionne mal ou présente des lacunes;
e) 51 % appuient l'installation d'égouts séparatifs publics;
f) 56 % appuient la réparation des réseaux d'égouts privés.

À la suite de ce sondage, le service d'urbanisme de Whitby a demandé au ministère de l'Environnement de déterminer s'il existait un problème de pollution à l'échelle de Brooklin. Le ministère a mené l'étude, calculé les données et rédigé un rapport, et le service d'urbanisme de Whitby a fourni des services de soutien.

L'étude a été divisée en deux parties; la première avait pour but d'évaluer le fonctionnement et le rendement des réseaux d'égouts actuels, et la deuxième visait à déterminer si le mauvais fonctionnement des systèmes avait des répercussions sur le ruisseau Lynde, qui traverse la localité.

BROOKLIN REPORT

INTRODUCTION

The purpose of the report is to document if there is a community-wide sewage problem with the existing private sewage disposal systems in the Community of Brooklin and their impact on Lynde Creek.

BACKGROUND

A technical review by the Ministry of the Environment of 1978 water quality records of Lynde Creek indicated that Water Quality Objectives were exceeded for bacterial densities and total phosphorus. The stream appeared marginally impacted upstream of Brooklin and showed a marked increase in bacterial contamination within Brooklin. The sources of the contamination are suspected to be agricultural, storm drainage and/or domestic sewage.

The Durham Regional Health Unit reported some malfunctioning sewage systems. Follow-up inspections did not uncover obvious sewage disposal system failures. No community-wide survey has been conducted by the Health Unit.

As a result of a public meeting on March 26, 1986, the community decided to distribute a confidential questionnaire to determine 1) community interest in servicing solutions; 2) individual support of a community wide sewage disposal survey; 3) the community's knowledge of efficiency, operation and maintenance of existing septic systems.

. . . 2

The results of the survey, from the questionnaire, mailed to 602 residences on April 18, 1986 indicated:

a. 62% response rate;
b. 82% of respondents would co-operate with community wide survey;
c. 69% are satisfied with present operation of system
d. 28% consider their systems to be malfunctioning or deficient;
e. 51% would support public sanitary sewers
f. 56% would support private sewage system servicing.

The Whitby Planning Department, subsequently, requested the Ministry of the Environment to survey Brooklin to determine if a community-wide pollution problem existed. A co-operative survey resulted, with the Ministry of the Environment conducting the survey, tabulating data, and preparing a report and the Whitby Planning Department providing support services.

Lynde Creek flows through the community. The survey was divided into two parts; the first being a survey of existing sewage disposal systems to quantify operation and performance and the second part to determine if malfunctioning systems are impacting Lynde Creek.

DESCRIPTION OF STUDY AREA

Brooklin is a residential community of approximately 602 residences (based on questionnaire circulation). It is in the Town of Whitby in the Regional Municipality of Durham.

. . . 3

The Darlington series soils predominate the area. It has a loam type consistency of clay loam till and considered to have imperfect drainage. The depth of soil appears to be twenty-five inches. The Whitby series occurs in the north-west corner of Brooklin and has the same characteristics as the Darlington series. Following the Lynde Creek is Bolton land series which is made up of recent alluvial deposits.[1]

SURVEY PROCEDURES

1. WATER QUALITY PARAMETER DESCRIPTION

Microbiological Analyses

These tests conducted by the Ministry of Health and Ministry of the Environment Laboratories in Toronto were the routine test carried out by that lab for Total Coliforms (TC) and Fecal Coliforms (FC). The TC group comprises all the aerobic and facultative and anaerobic, Gram-negative non-sporeforming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C or all organisms which produce a colony with a golden-green metallic sheen within 24 hours of incubation using the MF (Membrane Filter) technique. The presence of total coliforms in water is not a specific indicator of sewage or fecal pollution but may also indicate soil run-off.

---

[1]. Soil Survey of Ontario County - Report Number 23 of Ontario Soil Survey by A. B. Olding, R. E. Wicklund, and N. R. Richards .

. . . 4

Fecal Coliforms

The FC group of bacteria is basically a sub-group of the Total Coliforms and comprises aerobic and facultative and anaerobic Gram-negative non-sporeforming rod-shaped bacteria which ferment lactose at 44.5°C. The FC parameter is a more specific test for bacteria associated with human and animal fecal material. Fecal coliforms are found only in intestinal contents of warm blooded animals. They die fairly rapidly once outside the host environment and consequently this test has proven useful as an indicator of relatively recent fecal pollution inputs. It is however, by no means completely selective for Escherichia coli, the coliform most directly related to faecal pollution.

Chemical Parameters

Nitrates - are the end product of the aerobic stabilization of organic nitrogen and, as such, they occur in contaminated waters that have undergone self-purification or aerobic treatment process. Nitrate is usually associated with septic systems or agricultural practices. The maximum acceptable concentration for nitrates outlined in the "Ontario Drinking Water Objectives" of 10 mg/L (milligrams per litre) is based on considerations of the relationship between infantile methemoglobinemia and the presence of nitrate in drinking water.

. . . 5

Ammonia - is the most reduced inorganic form of nitrogen in water and includes dissolved ammonia (NH_3) and the ammonium ion (NH_4+). Nitrogen fixing bacteria, living in the symbiotic association with plants or in soil or water, reduce N_2 to ammonia and the ammonium ion. Ammonia is a highly soluble compound resulting from either the decomposition of nitrogen as nitrogenous organic matter or the microbial reduction of nitrates or nitrites under anaerobic conditions. It is a common constituent of treated sewage. Although free ammonia is often of vegetable origin and without hygienic significance, ammonium concentrations in water in excess of 0.10 mg/L renders the water suspect of recent pollution (Rudolf,1930).

Nitrite - is a chemical form of nitrogen that is usually found in minute quantities in surface water. Since nitrite is unstable in the presence of oxygen, it is quickly oxidized and occurs as an intermediate form between ammonia and nitrate (nitrification) or nitrates and nitrogen gas (denitrification). The nitrite ion can be used as a nitrogen source by plants. The presence of nitrites in water indicates active biological processes influenced by organic pollution. The maximum acceptable concentration of nitrite for drinking water (Ministry of the Environment) is 1 mg/L and like nitrate, was based on infant methemoglobinemia.

Total Kjeldahl Nitrogen - measures both ammonia and organic nitrogen. Both of these forms of nitrogen

. . . 6

are present in nitrogenous organic detritus from natural biological activities. Total Kjeldahl nitrogen may contribute to the overall abundance of nutrients in water and thus eutrophication. Ammonia and organic nitrogen are important for assessing available nitrogen and for biological activities. The maximum desirable concentration of 0.15 mg/L for organic Nitrogen was established primarily from aesthetic considerations. Organic Nitrogen is the difference between Total Kjeldahl and ammonia nitrogen.

Sodium - Sodium salts are extremely soluble in water and tend to remain in solution. Due to its reactive properties, some sodium may be removed by the ion-exchange phenomena in the passage of ground waters through certain soils. There is no established limit for sodium in drinking water in the province, but a "cautionary" limit of 20 mg/L is advisable for people suffering from cardiac renal or circulatory problems. "Common salt" or the compound sodium chloride, NaCl, is used as a de-icant for winter road maintenance operations, as a regenerant for water softeners and is commonly found as a constituent of septic waste. For these reasons, both the sodium and chloride ions were included in the test parameters.

Chloride - as a member of the halide group, is a major inorganic anion that occurs in variable concentrations in practically all natural waters. It may be of natural mineral origin, or as an input from any of the three sources cited in the preceding paragraph. The provincial objective of

. . . 7

250 mg/L was selected principally for aesthetic purposes due to the salty taste which may be imparted to the water.

Particulate Residue - Particulate residue or suspended solids refers to the quality of material that may be removed from a water sample by filtration. Suspended solids data is useful in evaluating the strength of domestic wastewater and in assessing the efficiency of wastewater procedures. Suspended solids enter streams from virtually every source, the most familiar being sewage treatment plant effluents, municipal storm drainage, industrial discharges and erosion.

High suspended solid levels are undesirable for municipal and industrial water supplies, fish and aquatic life, recreation and aesthetics.

Turbidity - The turbidity of water is attributable to suspended and colloidal matter such as micro-organisms, detritus, clay and other mineral substances which reduce clarity and diminish the penetration of light. Turbidity interferes with penetration of light, which could cause adverse effects towards the aquatic biological communities.

Dissolved Oxygen - An adequate supply of dissolved oxygen is required for maintaining self-purification processes in natural water

. . . 8

systems. Dissolved oxygen data determined in the field provides a rapid method of assessing the effects of oxidizable wastes of receiving waters and the capacity of a natural body of water for maintaining aquatic life. Dissolved oxygen in water may be derived from atmospheric transfer or photosynthetic processes in aquatic plants.

Temperature - Water temperature is an important factor when a number of water quality paramaters are being evaluated. Temperature directly affects the solubility of gases such as dissolved oxygen and significantly affects biological and the chemical reaction rates.

Biochemical Oxygen Demand (BOD_5) - BOD is not a pollutant and presents no direct harm to the aquatic environment. The BOD_5 test is a laboratory measurement of the dissolved oxygen required for the chemical and aerobic bacterial oxidation of carbonaceous and nitrogenous substances. In a sample incubated for five days at 20° centigrade, the most frequent damage caused by the discharge of organic waste to natural waters is the reduction of dissolved oxygen concentrations to levels which cannot support normal aquatic life. This oxygen depletion arises by the bacterial oxidation of carbon and nitrogen materials and eventually leads to a general deterioration of water quality for all uses.

Dissolved Inorganic Carbon (DIC) - Dissolved Inorganic Carbon test measures, dissolved carbon dioxide, bicarbonate and carbonate. Inorganic

. . . 9

carbon enters the water from the atmosphere and by weathering of carbonaceous rocks such as limestones and dolomites. Dissolved inorganic carbon is a measure of the buffering capacity of natural waters.

Dissolved Organic Carbon (DOC) - Most organic carbon in water is composed of humic substances and partly degraded plant and animal materials. Runoff from agricultural land and industrial discharges from industries contributes to the organic content of water in lakes and streams. The amount of organic carbon produced by photosynthetic processes will vary from season to season. The degradation of large amounts of organic matter causes dissolved oxygen depletion. In natural waters, the organic carbon content will usually be less than 30 mg/L.

Total Phosphorus - Phosphorus exists in natural waters and wastewaters in a number of forms, including orthophosphates, pyrophosphates, metaphosphates, polyphosphates and organically bound phosphates.

Phosphorus is a primary nutrient for plant and animal life and passes through cycles of decomposition and photosynthesis. Excessive plant growth in rivers and streams could result if total phosphorus levels exceed 30 ug/L.

Soluble Phosphorus - The soluble phosphorus fraction of an aqueous sample is the portion which passes through a filter, primarily orthophosphates.

. . . 10

Artificial inputs of phosphorus via wastewater and land runoff can promote an overabundance of algae and other aquatic growth which may impair water quality.

Calcium - Calcium is commonly found in deposits of limestone dolomite, gypsum and gypsiferous shale. It is present in all natural waters at levels which depend on the amount of contact with specific geological formations. Typically, levels in waters are less than 15 mg/L, but waters with carbonate rocks may contain up to 100 mg/L. Calcium enters lakes and streams through leaching of soils, weathering of rocks, industrial effluents and from roadsalt. Aqueous calcium compounds are generally non-toxic and represent no health hazard. Calcium is a major contributor to water hardness.

Alkalinity - The alkalinity of water is a measure of its capacity to neutralize acid. The alkalinity parameter is used to assess the buffering capacity to resist a pH change, that is, if an acidic waste is discharged into a natural water system, the effect on the water may not necessarily be a decrease in the pH, but may be detected as a drop in the alkalinity.

pH - The symbol pH is used to designate the logarithm (base 10) of the reciprocal of the hydrogen ion concentration. It is an index of the acidity or alkalinity of the solution. Most surface waters are protected from fluctuations in pH by the natural buffering capability of the bicarbonate ion. Pollution by industrial wastes

. . . 11

and acid precipitation can upset the natural buffering capability and produce significant pH changes in receiving water.

For the purposes of recreational activity, the pH should not exceed the range of 6.5 to 8.5.

2. STATION DESCRIPTION

Station 501 - Lynde Creek - Upstream from Columbus Road
 - Control or background quality

Station 502 - Lynde Creek - at intersection with Columbus Road, upstream from municipality of Brooklin

Station 503 - Lynde Creek - Way Street in municipality of Brooklin

Station 504 - Lynde Creek - Way Street intersection - immediately upstream from Hwy. 12

Station 505 - Lynde Creek - Cassels Street East intersection within municipality of Brooklin

Station 506 - Lynde Creek - Winchester Street intersection within municipality of Brooklin

Station 507 - Lynde Creek - below municipality of Brooklin and upstream from Hwy. 12 intersection

. . . 12

Station 10 - Storm Sewer Outfall - southeast quadrant of Hwy. 12 at Lynde Creek intersection (confirmed sewage discharge)

Station 20 - Storm Sewer Outfall - northeast quadrant of Hwy. 12 at Lynde Creek intersection (confirmed laundry sink wastes)

Station 30 - Storm Sewer Outfall - southeast quadrant of Winchester Road in Lynde Creek intersection (confirmed laundry waste)

3. WATER QUALITY

A water quality study was conducted on Lynde Creek, upstream, through and downstream from the community of Brooklin to determine if confirmed sewage and laundry waste discharges to Lynde Creek were impacting the surface water quality of Lynde Creek. At approximately three-week intervals, seven water quality sampling runs were conducted at seven monitoring stations (Appendix I) during the period commencing May 29 to September 24, 1986. Three storm sewer discharges were sampled during two monitoring periods, including a dry and wet event. Station descriptions are given on Page 11.

In all cases, samples were analyzed for the following bacteriological and general chemical parameters:

A. Bacteriological Parameters

Total coliform
Fecal coliform
Fecal streptococci

. . . 13

B. Chemical Parameters

Total alkalinity (alka)
5-day biochemical oxygen demand (BOD-5)
Total calcium
Total chloride (Chlor)
Conductivity (Cond)
Dissolved inorganic carbon (DIC)
Dissolved organic carbon (DOC)
Nitrogen - total Kjeldahl (Kjel)
- total ammonia
- nitrite
- nitrate
Phosphorus - total phosphorus
- dissolved phosphorus
Solids - particulate residue (suspended solids)
Turbidity
Dissolved oxygen
Temperature
pH

4. WELL QUALITY

The community of Brooklin has a communal well water supply. However, during the survey, private individual wells were observed in the community.

Information that was gathered indicates that approximately sixty private wells are in use throughout the study area. Twenty-one wells were randomly sampled to attempt to determine impact of ground water from septic systems. (Appendix VI)

. . . 14

5. PRIVATE SEWAGE SYSTEMS

The survey was conducted between June 2 and June 27, 1986. Six students worked in teams of two. Each team was given an area within Brooklin to survey. The survey team would attend a property, interview the owner/ occupant and survey the lot. The information collected included: type of building, number of occupants, sewage disposal methods; type, location and size, of on-site sewage disposal systems; type and depth of soil; and physical evidence of malfunctioning systems. All data collected was entered on survey forms. See Appendix II, III and IV. From this information, the performance of the systems was evaluated and given a performance classification.

Concern had been expressed about connections of laundry and basement washrooms to storm drainage systems. The survey teams attempted to locate this type of problem and it was given a separate performance classification. It was determined that camera surveys by the community of storm sewers indicated a large number of suspected illegal connections. Dye testing on a random basis was conducted to support this suspicion.

Because of the suspected connections to storm drainage, storm sewer outfalls were tabulated, see classification 9.

It was known that all systems could not be surveyed in the allowed time frame. Therefore, the teams worked throughout the community to present a community wide result.

. . . 15

RESULTS

1. STREAM WATER QUALITY INTERPRETATION

Bacteriological Quality

Bacteriological water quality indicators, such as fecal coliforms and fecal streptococci are groups of bacteria which can be related to the presence of sewage or fecal matter, contact with which could result in contraction of a disease from the pathogens. A potential health hazard may exist when fecal coliform geometric mean densities for a series of water samples exceeds 100 organisms per 100 mls.

Geometric mean densities of fecal coliforms ranged from 260 organisms per 100 mls at control station 501 to 2420 organisms/100 mls at station 506 with a similar measured geometric mean concentration at station 505 to 2100 organisms per 100 mls. These unacceptable fecal coliform levels infer a major bacterial input between stations 501 and 506. (See Appendix VII)

Fecal streptococci levels did not increase as dramatically as fecal coliforms but did range from 150 organisms per 100 mls at station 501 to 500 organisms per 100 mls at station 506 during dry periods. Fecal streptococci concentrations of 33,000 organisms per 100 mls at Station 10 and 5,800 organisms per 100 mls at Station 20 were higher in concentration than the wet weather concentrations with levels of 15,000 organisms per 100 mls (Station 10), and 2,300 organisms per 100 mls at Station 20. This condition suggests more concentrated microbiological levels during dry events.

. . . 16

WET EVENT (September Sampling)

During a storm event in September at storm sewer Station 10, 1.35 x 10^6 fecal coliforms per 100 mls were measured in the discharge. At storm sewer Station 20 and 30, fecal coliform concentrations measured at levels of 4,200 organisms per 100 ml and 6300 organisms per 100 mls respectively.

As a result, fecal coliforms increased from 1,600 organisms per 100 mls at the upstream Station 501 to 2,800 organisms per 100 mls at Station 506.

DRY EVENT (July Sampling)

During a dry period in July, 0.132 x 10^6 fecal coliforms per 100 mls were measured at Station 10. At station 20 and 30, fecal coliforms measured 26,000 organisms per 100 mls and 20,000 organisms per 100 mls respectively.

These high storm sewer fecal coliform discharges caused unacceptable instream levels of 2,280 organisms per 100 mls at Station 504 and 2,680 organisms per 100 mls at Station 506.

Higher fecal coliform concentrations at Station 20 and 30 during dry weather suggested stormwater dilution of microbiological concentrations during wet weather conditions.

Since abnormally high fecal coliform concentrations in storm sewer discharges occurred during dry weather conditions, illegal sanitary connections are suspected.

. . . 17

As indicated in the Ministry of Environment's Water Management booklet "when the ratio of the geometric mean densities of the fecal coliforms to fecal streptococci at the point of discharge exceeds 4/1, the source of discharge is likely to be human in origin. A ratio of less than 0.7 suggests that the source is probably non-human origin." In both event cases, the ratio exceeded 4/1, suggesting that the sources of the discharge was of human origin.

A review of the sludge activities north and west of the community of Brooklin was enacted to determine potential sources other than domestic hook-ups. The search revealed no sludge utilization in the Brooklin area in the last 10 years. As a result, sludge utilization on neighbouring farm fields can be eliminated as a possible source of bacterial input.

Chemical Quality

The water chemistry was generally satisfactory with the exception of total phosphorus (Appendix V).

The mean total phosphorus levels of 0.415 mg/L at storm sewer station 10, 0.23 mg/L at station 20 and 0.35 mg/L at station 30 raised mean in-stream background levels ranging from acceptable concentrations of 0.021 mg/L to 0.028 mg/L at stations 501 to 504 to unsatisfactory mean levels of 0.038 mg/L and 0.034 mg/L at stations 506 and 507 respectively.

If a total phosphorus MOE guideline of 0.03 mg/L in streams is exceeded, nuisance and excessive plant growth could result.

. . . 18

The remaining mean in-stream parameter values were at acceptable concentrations and indicated no potential water quality impact in Lynde Creek.

2. PRIVATE SEWAGE SYSTEMS

On April 18, 1986, the Town of Whitby Planning Department distributed a questionnaire to 602 residences in the Brooklin community. It is assumed that this is the coverage area for the community of Brooklin. The survey conducted by the Ministry of the Environment during June 2 to June 27, 1986, obtained information on 329 properties. Therefore the survey coverage is 55%.

CLASSIFICATION OF SEWAGE DISPOSAL SYSTEMS

The sewage disposal systems of all premises surveyed were classified into one of the following groups.

1. Satisfactory

   A system which meets the current standards of good design, construction and location, is properly maintained, is capable of handling sewage flows and is not causing a pollution problem. Seven (7) systems or 2.1% were placed in this category.

2. Satisfactory Performance

   This is a system which may be slightly deficient in design, setback or construction with respect to current standards. The deficiency, however, cannot be of a nature that would constitute a pollution problem. One hundred and six (106) systems or 32.2% were placed in this category.

. . . 19

3. Seriously Substandard

A system which does not meet current standards of design, construction and location is in a state of neglect or has a limited life. The system is not presently causing a pollution problem, however, the system due to a serious deficiency will not be capable of treating the sewage flows in the near future. One hundred and twenty-three (123) systems or 37.4% were placed in this category.

4. Nuisance (grey water)

Washwater is also known as grey water and is classified as sewage. This system causes grey water to be exposed on the surface of the ground either directly through a waste pipe or escaping from a leaching pit. Thirty (30) systems or 9.1% were placed in this category.

5. Nuisance (black water)

This type of system causes sewage to be exposed on the surface of the ground, either directly through a pipe or escaping from some part of the sewage disposal system. Nineteen (19) systems or 5.8% were placed in this category.

6. Direct Pollution

This system permits sewage or leachate to contaminate the surface water. Zero (0) systems were placed in this category.

. . . 20

7. Unclassified (temporarily)

This system has been given a preliminary classification by the student inspector where he feels he cannot use any of the preceding classifications and has doubts about the system, or any part of it. Seven (7) systems or 2.1% were placed in this category.

8. Unclassified

This system is not possible to classify. Zero (0) systems were placed in this category.

9. Storm Sewer Discharge

This type of system discharges sewage directly to a drainage ditch or storm sewer. Basement laundry and sewage pumps discharging to ditches or storm sewers were placed in this category. Thirty-seven (37) systems or 11.3% were placed in this category.

The percentage of Classifications 1 and 2 (Satisfactory and Satisfactory Performance Systems) found at Brooklin are comparable to other sewage system surveys. A 1985 Musselman's Lake Survey[1] compared to Brooklin indicate the following:

[1] Water Quality and private sewage disposal surveys of Musselman's Lake, Whitchurch-Stouffville Township, Regional Municipality of York by M.O.E. 1985.

. . . 21

Classification	Brooklin	Musselman's Lake
	%	%
1. Satisfactory	2.1	3
2. Satisfactory Performance	32.2	35

Therefore, the percentage found is in line with other community surveys.

A closer look at the Classification 3 (Seriously Substandard) indicates 41.5% (51) were found to have septic systems undersized but have good soil conditions. 39.8% (49) of the systems were found to be undersized and located in poor soil conditions. 18.7% (23) systems were found to have systems that would have been classified as satisfactory performance except for poor soil conditions.

The Classification 4 (Nuisance - grey water) and Classification 5 (Nuisance - black water) relate to on ground surface, broken pipes and broken septic tanks. 14.9% (49) systems found in this category are health problems as well as environmental problems.

The Classification 9 (Storm Sewer Discharge) was isolated in this survey because of reports from the Public Works Department and Planning Department about numerous complaints of laundry drains and basement washrooms discharging to storm sewers and drainage ditches.

Properties in this classification may also have other sewage disposal problems but for the purposes of the survey the Classification 9 was identified as the critical problem.

. . . 22

The Public Works Department also had conducted a camera survey of storm sewers in Brooklin which showed a possible 69 direct connections. This survey did not include Highway 12 (Baldwin Street) or Winchester Road East.

The survey covered every street in the community. Residences were picked at random and revisits were conducted in an attempt to cover the entire community.

Due to concern for direct discharge of sewage to the creek via storm sewers and drainage ditches, a dye testing program was undertaken on 10 residences during the survey period. It was conducted on the following streets, Baldwin, Winchester, George, Princess and Centre. The dye (Rhodamine WT) was placed in the toilet and laundry waste pipe. The observation point was the nearest open pipe outfall.

Classifications 4, 5 and 9 were chosen for the dye testing.

The results showed four positive and six negative tests. In Classification 4 there was one positive and one negative test. In Classification 5 there were one positive and two negative tests. In Classification 9 there were two positive and three negative tests.

The fact that testing showed positive in two of five tests in Classifications 4 and 5 is significant due to the fact that visual problems have already been observed and the system is further malfunctioning causing direct disharges to the outfalls.

. . . 23

The negative tests in three tests of the Classification 9 may be attributed to distance from building to outfall and low flow in the storm sewer.

This testing shows that 40% of the Classifications 4, 5 and 9 are direct dischargers.

3. WELL QUALITY

Ground water supplies reporting chlorides in the 25-75 mg/L range in combination with any detected nitrate are likely primarily impacted by either septic systems and/or past agricultural practices. Five of twenty sampled wells are suspected to be impacted.

Sodium chloride concentrations were elevated in every well sample. Malfunctioning septic systems, water softeners or road salting operations are suspected.

All wells sampled during the study, except two, showed bacteriological activity.

A follow-up survey with the well owners indicated that 80% is the potable water supply for the owners.

See Appendix VI for well survey results.

SUMMARY AND CONCLUSIONS

1. STREAM WATER QUALITY

The geometric mean density of fecal coliforms is above provincial water objectives at all sampling stations. The geometric mean rises significantly as Lynde Creek flows through Brooklin. (See Appendix V)

. . . 24

During the dry event fecal coliform remained high (20,000 to 26,000 organisms per 100 ml) at storm water outlets. The high organism counts at the outlet, continued flow in the storm drains during dry periods and fecal coliform to fecal streptococci ratio exceeding 4/1 make the connections of sewage systems to the storm drains highly suspect.

High fecal coliform concentrations in the confirmed storm sewer discharges sampled during the wet and dry events had an unsatisfactory bacteriological impact on Lynde Creek. The maximum measured fecal coliforms in the stream and outfall occurred during the wet sampling run with concentrations of 3,400 organisms per 100 ml at station 505 and 1,350,000 organisms per 100 ml at storm sewer station 10 respectively. A potential health hazard exists if the fecal coliform geometric mean density for a series of water samples exceeds 100 per 100 ml.

The storm sewer discharges (containing laundry and sewage wastes) are responsible for elevated total phosphorus levels in Lynde Creek which could cause potential nuisance growths of plants and algae downstream from the municipality of Brooklin.

2. WELL QUALITY

The microbiological and chemical well water results indicate a consistent impact on ground water throughout the survey area. Possible sources of the contamination are septic systems, road salting, water softeners and/or agricultural practices.

. . . 25

3. PRIVATE SEWAGE SYSTEMS

28.3% of the surveyed systems are presently malfunctioning.

37.4% of the surveyed systems were not malfunctioning at the time of inspection, but due to undersizing and soils will require upgrading in the near future.

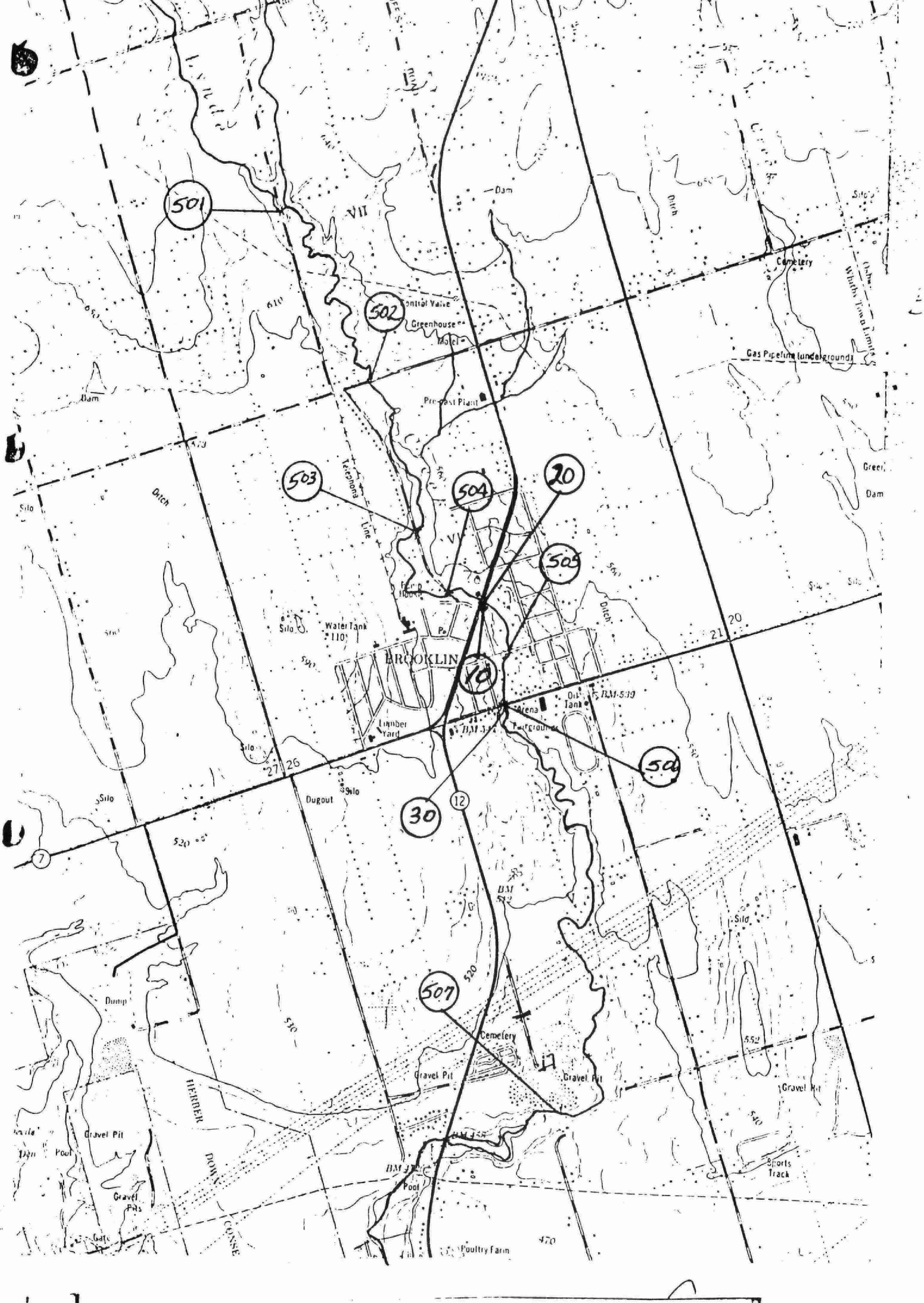
11.3% of the systems are knowingly connected to the ditches or storm sewers. The Public Works Storm Sewer Survey reveals a suspected 69 direct connections to the storm sewers. The dye testing revealed that Classification 4 and 5 as well as Classification 9 were directly connected to the storm sewers. The random dye testing revealed 40% (4 systems) of Classifications 4, 5 and 9 are direct connections.

RECOMMENDATIONS

1. There is a community wide sewage problem from private sewage disposal systems. There is a significant impact on Lynde Creek and ground water. Therefore, the municipality should undertake engineering studies to investigate alternative sewage disposal methods.

2. Residents using wells as potable water supplies should connect to the communal water system.

APPENDIX I


501
502
503
504
20
505
10
50(
30
507
12
7
BROOKLIN
VII
VI
Dam
Control Valve
Greenhouse
Motel
Pre-cast Plant
Telephone Line
Ditch
Silo
Water Tank
Farm House
Cemetery
Whitby Town Limits
Gas Pipeline (underground)
Green
Arena
Oil Tank
BM 539
Fairgrounds
Lumber Yard
Dugout
Gravel Pit
Dump
Pool
Gravel Pits
Gate
Sports Track
Poultry Farm
HERDER
610
630
590
560
550
552
540
530
520
470
20
21
26
27

APPENDIX II

Ministry of the Environment
Ontario

COTTAGE POLLUTION CONTROL PROGRAM

ESTABLISHMENT IDENTITY

LAKE OR RIVER No	ESTABLISHMENT SURVEY No	SUB EST No	TRANS CODE
1 – 6	7 – 11	12 – 13	14 – 15

ESTABLISHMENT DESCRIPTION

CARD No	HYDRO METER No	DATE OF INSPECTION DAY MONTH YEAR	LOT SIZE	UNIT OF LOT SIZE SQ FT	ACRES	USE	No OF OCCUPANTS AVERAGE	MAXIMUM	No. BEDROOMS	ESTABLISHMENT TYPE
0 1	18	26	32	40	41	42	43	47	51	53

ACCESSIBLE BY ROAD Yes ___ 55 No ___ 56 NAME OF ROAD ____________

USE
1 SUMMER ONLY
2 YEAR ROUND
3 SUMMER OCCASIONAL WINTER
4 PREDOMINANT WINTER
5 NOT IN USE—CLOSED
6 UNDER CONSTRUCTION

TYPE OF ESTABLISHMENT
01 PRIVATE COTTAGE
02 CABIN ESTABLISHMENT
03 COTTAGE ESTABLISHMENT
04 CAMP
05 PICNIC AREA/PUBLIC PARK
06 MARINA
07 HOTEL/MOTEL
08 RESTAURANT
09 STORE
10 FARMHOUSE
11 CLUB
12 INDUSTRIAL
13 BOATHOUSE
14 PERMANENT HOME
15 CAMPGROUND/ TRAILER PARK
16 OTHER

ESTABLISHMENT OWNER

TITLE ______ 57 INITIALS ______ 61 SURNAME ____________ 64 70 80

TELEPHONE No ____________

IF PERSON INTERVIEWED IS NOT OWNER NAME ____________

MAILING ADDRESS

CARD No 0 2 OWNER'S PERMANENT MAILING ADDRESS
15 ____________
45 ____________
55 ____________

CLASSIFICATION

PRELIMINARY ☐ FINAL ☐

1 SATISFACTORY
2 SATISFACTORY PERFORMANCE
3 SERIOUSLY SUBSTANDARD
4 NUISANCE (WASH WATER)
5 NUISANCE (TOILET, SOLID WASTE)
6 DIRECT POLLUTER
7 UNCLASSIFIED TEMPORARILY)
8 UNCLASSIFIED

INITIALS ____________

DESCRIPTION OF FACILITIES

CARD No 0 3

FIXTURES & APPLIANCES											TOILETS									
BATHROOM (No. of)	[illegible]	BATH WITH SHOWER	BATH	STALL SHOWER	[illegible]	AUTOMATIC DISHWASHER	WASHING MACHINE ([illegible])	WASHING MACHINE (Auto.)	LAUNDRY TUB	GARBAGE GRINDER	STANDARD FLUSH	URINAL	LOW VOLUME FLUSH	PIT PRIVY	VAULT PRIVY	AQUA PRIVY (Gal. a day)	INCIN. TOILET – GAS	INCIN. TOILET – ELECT	CHEMICAL TOILET	OTHER (Specify)
QUANTITY 13															32			40		

DRINKING WATER SOURCE [illegible]

PIPED WATER YES ___ NO ___ OTHER ___ 52

SLOPE OF LOT GROUND 53
0-5% (Flat)
5-10% (Moderate)
10-20% (Mod. Steep)
>20% (Steep)

DRINKING WATER TREATMENT [illegible]

NONE [illegible]

REFUSE
[illegible] MUNICIPAL DUMP
4 DEPOSITED IN LAKE
5 DEPOSITED ELSEWHERE
7 BURNT
INCINERATED

SEPTIC TANKS

CARD No
0 4

TANK No	CAPACITY LIQUID	CAPACITY TOTAL	CAPACITY GALLONS	YEAR INSTALLED	LAST YEAR CLEANED	MATERIAL	APPROVAL	APPROV AGENCY
18	19		21	25	27	29	30	31
42	43		45	49	51	53	54	55

MATERIAL
1 CONCRETE 4 CONC BLOCK
2 STEEL 5 OTHER (SPECIFY)
3 FIBERGLASS

APPROVAL
1 NO REFERRAL 3 NOT APPROVED
2 REFERRAL NOT YET APPROVED 4 APPROVED

APP AGENCY
1 HEALTH UNIT
2 MIN OF ENV
3 MUNICIPAL

TILE FIELDS

FIELD No	TOTAL LENGTH OF TILES (FT)	DISTANCE BETWEEN LINES (FT)	HEIGHT ABOVE LAKE (FT)
32	33	37	39
56	57	61	63

BACTERIOLOGICAL SAMPLE RESULTS

CARD No
0 5

TOTAL COLIFORM
18
27
36
45
54
69

FAECAL COLIFORM
22
31
40
49
61
71

LOC'N
D

1 to 9 — NORMAL LAKE OR RIVER SHORE SAMPLE No
D — DRINKING WATER
S — SEWAGE SAMPLE
C — CONTROL SAMPLE

EVALUATION OF SYSTEM

CARD No
0 6

DISTANCE TO
1 [illegible]
2 [illegible] WASTE [illegible]

TYPE OF WASTE

PERFORMANCE
1 POLLUTING DRINKING WELL
2 POLLUTING GROUND WATER
[illegible]
EFFLUENT BREAKING [illegible]
EFFLUENT BREAKING [illegible]
LEAKING
[illegible]

SOIL PROFILE

CARD No
0 7

SOIL TYPES
1 ORGANIC 4 SILT
2 GRAVEL 5 CLAY
3 SAND

HOLE 1
(IN TILE FIELD IF ONE EXISTS)

	SOIL STRATUM (FT)	MAINLY COMPOSED OF	WITH CONSIDERABLE AMOUNT OF	MINOR AMOUNT OF
FIRST		20	21	22
NEXT		25	26	27
NEXT		30	31	32
NEXT	33	35	36	37

HOLE 2
(IN TILE FIELD IF ONE EXISTS)

	SOIL STRATUM (FT)	MAINLY COMPOSED OF	WITH CONSIDERABLE AMOUNT OF	MINOR AMOUNT OF
FIRST	42	44		46
NEXT	4	4		
NEXT	52	54	55	
NEXT	57	59		

DEPTH TO IMPERVIOUS LAYER
OR
DEPTH TO GROUND WATER
62
64

DEPTH RANGE [illegible] SAMPLE PROPERTY
FT TO FT
SOIL IS
NATURAL
FILL
INSUFFICIENT SOIL
UNSUITABLE SOIL

[illegible] BY [illegible]

ESTABLISHMENT IDENTITY

LAKE OR RIVER No
ESTABLISHMENT SURVEY No
[illegible] No

APPENDIX III

Ministry
of the
Environment
Ontario

SKETCH

INSPECTOR(S)

ESTABLISHMENT SURVEY No.

LAKE OR RIVER

NOTE BORE HOLE THUS ⊕

NOTE PROBE LOCATION THUS ✕

REMARKS SUMMARY OF FINDINGS AND REASON(S) FOR CLASSIFICATION (BY INSPECTOR)

MOE 1078 5/76

APPENDIX V

LYNDE CREEK - MEAN CONCENTRATION

Station	Residue . Particulate	Tur-bidity	Diss. Oxygen	Temp °C	BOD5	DIC	DOC	Bacteria/100ml (G.M.)			Phosphorous		Nitrogens				Cond. umho/cm	Calcium	Alka	Chlor	pH
								Total	Fecal	Strep.	Total	Sol.	Free Ammonia	Kjel.	Nitrite	Nitrate					
501	5	3	8.5	16.1	1.0	45	4	1300	260	150	0.021	0.009	0.011	0.381	0.005	0.408	474	77	224	25	8.5
502	10	6	9.5	18.3	1.0	49	4	900	300	220	0.024	0.008	0.012	1.039	0.008	1.031	498	82	232	25	8.4
503	13	8	8.3	15.6	1.0	49	4	1100	470	210	0.028	0.009	0.017	0.79	0.011	0.708	508	84	236	28	8.4
504	12	8	8.4	15.8	1.0	48	4	5000	1300	200	0.027	0.010	0.011	0.390	0.010	0.719	517	84	234	31	8.4
505	11	8	8.8	16.3	1.0	49	4	-	2100	400	0.031	0.025	0.017	0.390	0.014	0.749	537	85	238	36	8.4
506	12	8	8.5	16.3	1.0	47	4	15000	2420	500	0.038	0.017	0.020	0.413	0.016	0.721	544	86	239	32	8.4
507	14	9	8.4	18.2	1.0	62	5	-	600	180	0.034	0.011	0.024	0.535	0.014	0.589	556	87	243	30	8.4
10	11	4	7.7	17.2	5.6	78	4	-	422000	22000	0.415	0.391	0.915	1.090	0.565	4.36	1645	148	379	250	8.3
20	2	1	8.5	16.1	1.0	73	3	-	10000	3600	0.230	0.198	0.172	0.500	0.172	4.00	1500	142	373	211	8.3
30	22	3	7.5	17.3	2.3	81	4	-	11000	700	0.350	0.304	0.170	0.648	0.134	4.30	1222	151	392	158	8.2

Parameters Expressed In Mg/L Unless Otherwise Noted

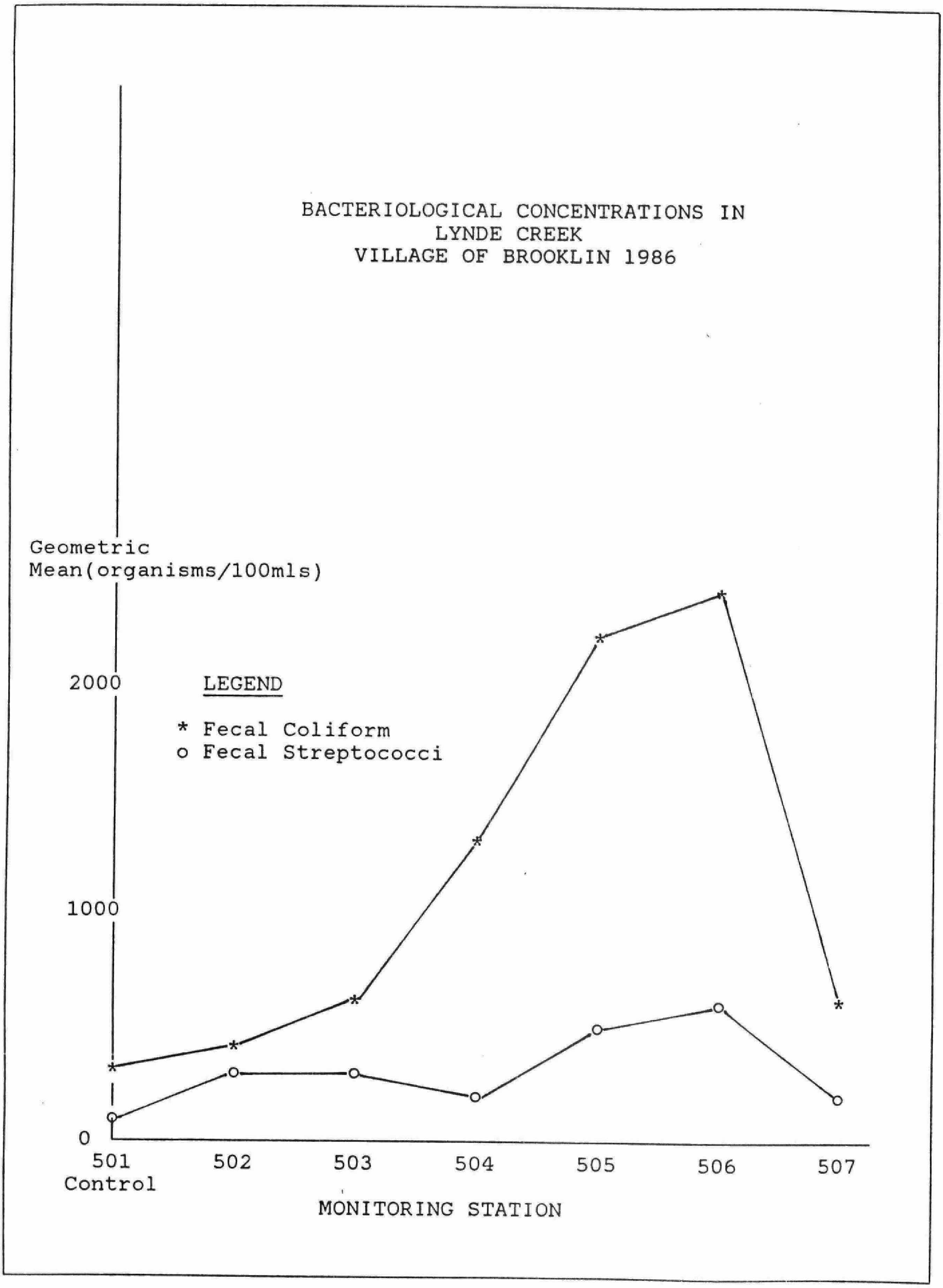
Bacteria Expressed In #Bacteria/100 MLs (Geometric Mean-G.M.)

APPENDIX VI

SAMPLE NO.	SODIUM mg/L	CHLORIDE mg/L	TOTAL KJELDHAL mg/L	AMMONIUM mg/L	NITRITES mg/L	NITRATES mg/L	TOTAL COLIFORM	FAECAL COLIFORM
38-128	81.0	168.00	2.00	<.05	<.005	10.80	>160	1
38-151	46.8	43.00	1.60	<.05	.005	10.00	>160	0
38-157	34.4	45.00	0.60	<.05	.020	6.95	>160	29
38-102	143.0	367.00	0.80	<.05	.025	2.10	>160	0
38-159	71.5	136.00	<.40	<.05	<.005	1.00	50	0
38-125	192.0	450.00	<.40	<.05	<.005	1.95	>160	0
38-260	20.6	22.50	0.60	<.05	<.005	12.50	86	0
38-245	43.4	41.00	0.60	<.05	<.005	6.65	130	2
38-126	48.2	79.00	<.40	<.05	<.005	10.10	70	0
38-175	7.0	19.00	<.20	<.05	.005	4.38	>160	0
38-265	54.5	120.00	0.60	<.05	<.005	10.40	84	0
38-366	* I.S.	I.S.	I.S.	<.05	<.005	<.05	60	0
40-135	53.5	85.50	<.40	<.05	.005	6.90	0	0
40-076	190.0	342.00	<.20	<.05	.005	3.25	>160	18
9	17.1	23.00	0.60	<.05	.010	9.45	140	0
38-104	63.2	125.00	0.20	<.05	.005	8.85	>160	0
38-288	29.9	75.50	1.40	.05	.005	6.10	>160	0
40-825	60.0	167.00	0.20	.05	.005	1.85	0	0
40-142	28.3	30.50	0.40	<.05	.005	6.05	>160	6
40-815	57.9	163.00	<.20	<.05	.005	0.20	44	4
41-040	469.0	491.00	0.20	<.05	<.005	6.80	140	3

*I.S. means Insufficient Sample

APPENDIX VII



BACTERIOLOGICAL CONCENTRATIONS IN
LYNDE CREEK
VILLAGE OF BROOKLIN 1986

969360000009527